

Hæckel has, we know, spoken disparagingly enough of mere systematism, and compared it to "postage-stampology" (the word "philately" had not then been invented). But we read in the dedication of the "Generelle Morphologie" to Gegenbauer how, as a boy of twelve, he had collected a herbarium of local plants with a set of intermediate forms between the "critical species," and already had been led thereby to doubt the orthodox view of the constancy of species; we know his masterly unravelling and grouping of the appalling wealth of forms in the Radiolaria. De Bary once said to the writer: "Without a good systematic knowledge to begin with, no botanist can tell where he is, nor what he is dealing with." Charles Darwin began as a collector, and monographed the Cirripedia, and Alfred Russel Wallace was a collecting naturalist. If we want to place ourselves on a par with Austrian and German biologists we must reform our teaching of botany on the common-sense lines followed so successfully abroad, and once introduced by Henslow into the primary teaching of his village school in East-Anglia. As a preliminary to the morphology and bionomics of our academic programmes, there must be laid a sound foundation in the knowledge of organic external form and variety. And so the scientific training of the individual will be pursued on lines corresponding to the acquirement of scientific knowledge by the race, a course which should, at least in this case, commend itself to all educational reformers.

M. H.

GEOGRAPHICAL DISCOVERY.

L'Epoca delle grandi Scoperte geografiche. Di Carlo Errera. Con 21 carte, &c. Pp. xvi + 432 (text, 357). (Milano: Hoepli, 1901.) Price L.6.50.

THIS useful, brightly-written and well-illustrated summary of the geographical progress of Christendom, from the beginning of the Middle Ages, is divided into twelve parts, of which the first eight deal with the pre-Columbian time and the last four with the great age of discovery, from Columbus to Magellan. Among the twenty illustrations are four reproductions of early mediæval maps, from Miller and Beazley, one of Carignano's Portolano of 1300, one of Fra Mauro's map of 1459, one of a section of Juan de la Cosa's chart of 1500, one of the Strassburg Ptolemy of 1513, and one of the 1529 *mappe-monde* of Diego Ribero. Most of the latter are reproduced from Ruge's "Geschichte des Zeitalters der Entdeckungen." In its text the present work is also mainly based, for its later chapters, upon the same and other works of Ruge's, as well as upon Kretschmer's "Entdeckung Amerikas," Nordenskjöld's "Facsimile Atlas," HARRISSE's "Christophe Colomb" and other studies, and Günther's "Zeitalter der Entdeckungen"; for its earlier upon Nordenskjöld's "Periplus," Hughes' "Storia della Geografia," Heyd's "Commerce du Levant," Uzielli and Amat's "Studi biografici . . . sulla Storia della Geografia," K. Miller's "Mappæmundi," Beazley's "Dawn of Modern Geography," Avezac's edition of, and introduction to, Carpinì, Yule's Marco Polo, &c.

But although essentially a compilation from more extensive and specialised studies on the history of exploration, Prof. Errera's contribution to the "Collezione Storica Villari" has great merits. It describes with excellent

lucidity, compression, and good sense the chief epochs in the great drama of European awakening to a fuller knowledge of the world. No attempt, indeed, is made to treat (except allusively) of Arab or Chinese exploration and geographical study; and it might be said that a somewhat fuller appreciation of the latter is almost indispensable for a complete understanding of the European advance to which Prof. Errera restricts himself. It might also be objected that a chapter on the exploration of the north (No. vii. "La Conoscenza del Settentrione"), including the description of the Scandinavian voyages to Iceland, Greenland and Vinland, should precede, and not follow, chapters (iv.-vi.) on the growing knowledge of Asia among Europeans during the thirteenth, fourteenth, and fifteenth centuries.

Once again, more attention might have been given to the career and first voyage (1497) of Giovanni Caboto; and, to instance a very small point, Konrad Miller's "Ebstorfkarte" is not separate from his "Mappæmundi: Die ältesten Weltkarten," but heft v. of the same. But little fault, as a whole, can be found with the way in which the author brings out, section by section, his epitome of what he defines, in his preface, as the "progressive extension of the knowledge of the superficies of our planet," down to the era of the first voyage round the world.

A special word of thanks is due to the excellent critical judgment with which the difficult voyages of the Zeni are handled—a subject hard enough in itself and doubly hard for a fellow-countryman of Nicolo and Antonio Zeno. Italians, perhaps, did more than any other people—more even than Scandinavians and Portuguese—for the advance of European trade and exploration, as well as for the perfecting of geographical science; from Antoninus of Placentia to Marco Polo and Ludovico Varthema, from Malocello and the Vivaldi to Columbus, Verrazano and the Cabots, from Flavio Gioja to Fra Mauro and Toscanelli, Italian travellers, merchants, and men of science bore a foremost share in the work of opening up the world. Among the early Portolani, the first true maps ever set forth, an overwhelming preponderance (413 out of 498) are Italian; and the whole of modern trade, with all the possibilities of civilising progress which it contains, might almost be called a discovery of Italian genius. Italian scholars of the present day may, therefore, be said to have a special claim upon the subject here discussed, as the subject has a special claim upon them; and although this *breve storia* has not the original value of Marinelli's remarkable study on the geography of the Dark Ages, it deserves a most cordial welcome.

OUR BOOK SHELF.

Die Tierwelt der Schweiz in ihren Beziehungen zur Eiszeit. Von Prof. Dr. F. Zschokke. Pp. 71. (Basel: B. Schwabe, 1901.) Price Mk. 1.20.

HERE in short compass we have set forth the relation of the flora and especially of the fauna of Switzerland to the Glacial period. Geologists have been wont to cite the occurrence of Arctic plants in the Alps and the mountains of middle Europe as strongly confirming their belief in the former prevalence of a glacial climate in what are now temperate latitudes. In his present work the author shows that, however cogent that evidence may be, it is in no degree stronger than that derived from a

study of the animal life, and more particularly of the water-life, of the Alpine lands. After briefly summarising the evidence supplied by the Arctic-Alpine plants, Prof. Zschokke refers to the former distribution of Arctic-Alpine vertebrates in the low grounds at the foot of the mountains, and gives a succinct account of the land-shells, butterflies and beetles met with in the higher Alps—many of which are true Arctic species. The major portion of his treatise, however, is devoted to the origin of the fauna of the Alpine lakes and streams. It would appear that many of the forms now flourishing in the ice-cold waters of the higher Alps hail from Arctic regions. Even in the large lakes at the foot of the mountains a glacial relict-fauna is encountered. Special reference is made to the Salmonidæ of these lakes, which are now cut off from the headquarters of their kind in the far north. They doubtless immigrated from the north during Glacial or early post-Glacial times, when such vast tracts of middle Europe were under water, or traversed by swollen rivers and great "canals," and when many of the Alpine lakes were in free communication. It is noteworthy that the Alps stopped migration further south, and that the fish in question do not occur in the Italian lakes. Eventually the limitation and interruption of water-communication with the north led to the trapping of the Salmonidæ in the great lakes. And now so long a time has elapsed since then that varieties and even new species have been developed. The fish can no longer migrate from lake to sea as their northern cousins do; but it is interesting to learn that at spawning time they still gather in shoals, as if they were about to set out on a journey. Perhaps this may be a remembrance of former conditions. Prof. Zschokke traces very graphically the changes in the life of the Alpine lands which ensued on the gradual disappearance of the extreme glacial climate. In the ice-cold waters of the higher Alps the Arctic types of life flourish at the surface, just as they do in the lakes and streams of Greenland. At the foot of the mountains, however, they are no longer met with at the surface, but have descended to the cold dark depths of the great lakes. As the mountains of middle Europe became at the close of the Glacial period "cities of refuge" to which the Arctic-Alpine flora retreated, so in like manner they have afforded shelter here and there to colonies of those Arctic forms of animal life which are still so abundant in the tarns and streams of the higher Alps, but have their headquarters in the ice-cold waters of the Arctic regions.

A Treatise on Elementary Statics for the Use of Schools and Colleges. By W. J. Dobbs, M.A. Pp. xi + 311. (London: A. and C. Black, 1901.) Price 7s. 6d.

THE author has already written an excellent book on geometrical statics, and it has been his present object to produce an elementary treatise which shall cover the well-trodden ground of the parallelogram of forces, moments and couples, centres of gravity, work, machines and friction, and at the same time shall develop the subject simultaneously from its geometrical and analytical aspect. It is sufficient to open the book almost anywhere to find evidence of originality in the treatment. Thus in the introduction the author does not leave his readers ignorant of the existence of non-rigid bodies (p. 7). Again, in dealing with the parallelogram of forces, he wisely eschews the fallacious so-called dynamical proof and gives an ingenious modification of Duchayla's proof, together with an experimental verification in which three strings stretched by spring balances, instead of being knotted together, are attached to a triangular string which forms a funicular triangle of the forces. This plan has the advantage of also showing that three forces in equilibrium meet at a point when produced. The proof of the formula for the resultant of two parallel forces is based on the "funicular" method—a change

that will be most refreshing to examiners. Whenever a question is set in any examination, in which candidates are asked to find the resultant or centre of a number of parallel forces in such cases as that of a rod loaded at different points, where the answer comes out in a line by taking moments, pages and pages of work are usually sent up with the old familiar figure and proof for the resultant of *two* parallel forces: "(1) when the forces are like; (2) when the forces are unlike," and so on, finishing up with the lame conclusion that the resultant "may be found." The author's treatment of friction strikes us as a very sensible innovation, the laws of friction being based on a consideration of the angle of friction, and the coefficient of friction being defined as the tangent of this angle. There are a few points we do not altogether care about; for example, a crowbar problem on p. 119, where "perfect roughness" exists between the stone and the ground and between the crowbar and ground, and "perfect smoothness" between the sharp edge of the stone and the crowbar. In connection with such a problem, too, the author might do well in Chapter v. to say something about the direction of the reaction when an *edge* of one body rests against, but does not dig into, the surface of another. The book is copiously supplied with examples.

The Country Month by Month. By J. A. Owen and G. S. Boulger. New edition. Pp. viii + 492. (London: Duckworth and Co., 1902.) Price 6s. net.

THE best testimony to the appreciation of this work by the reading public is that it has reached a second edition—this being enlarged by the addition of notes written by the late Lord Lilford. Mrs. Owen, who, as editor of the delightful series of books bearing the signature "A Son of the Marshes," has had a large experience of works dealing with English country life, is responsible for the portion of the present volume treating of the habits of animals, while Prof. Boulger has written the botanical portion. The partnership may be said to have turned out in every way a success.

As the authors say in their preface, popular works on natural history absolutely swarm at the present day, but there is no other which gives in such detail the changing phases of animal and vegetable life throughout the twelve months of the calendar. It is, in fact, an expansion of Gilbert White's "Naturalists' Calendar," written in an interesting and attractive style and containing much information which should be of use to the working naturalist. In addition to the accounts of the habits of animals, there are many observations scattered through the book which, if not new, are at all events out of the common.

For instance, on p. 111 we find the remark that while the French commonly name birds from their notes, the English more generally call them after their appearance or habits. The observation (p. 418) that night-herons are increasing in number in Britain may perhaps be connected with the depopulation of country districts of which we hear so much nowadays. And Lord Lilford's note (p. 188) that frogs, small eels and young birds form the favourite food of the otter strikes us as entirely novel, since in Bell's "British Quadrupeds" we are told that "the otter lives exclusively on fish, when it can procure them." Nor do the authors confine their observations to wild animals, an interesting statement being made on p. 468 that the Angora rabbit (or at all events one individual thereof) sheds its coat entire. Misprints and other errors appear few and far between, although on p. 419 we notice "nob" standing in place of "knob." We may add that we fail to see the advantage of putting the date 1902 on a book which was in the reviewer's hands by the middle of November 1901.

To all lovers of the wild nature of our country this work should prove, not only acceptable, but invaluable.

R. L.